WHAT IS CLAIMED IS:

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1. A spin-valve thin-film magnetic element comprising:

a laminate comprising at least a free magnetic layer and a pinned magnetic layer and exhibiting a magnetoresistive effect;

a pair of hard bias layers lying at least on both sides of the free magnetic layer in the track width direction and orienting the magnetic moment of the free magnetic layer in one direction;

a pair of insulating layers extending over the hard bias layers and both ends of the laminate in the track width direction; and

a pair of lead layers extending on said pair of insulating layers,

wherein said pair of lead layers have overlay sections which extend towards the center of the laminate and are in direct contact with parts of the laminate.

2. A spin-valve thin-film magnetic element according to claim 1, wherein the width of the edge of each of the overlay sections in the track width direction is in the range of 0.01 μm to 0.05 μm.

3. A spin-valve thin-film magnetic element according to claim 1, wherein the insulating layers comprise at least one oxide selected from the group consisting of aluminum

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oxide, silicon oxide, tantalum oxide, titanium oxide, zirconium oxide, hafnium oxide, chromium oxide, vanadium oxide, and niobium oxide.

4. A spin-valve thin-film magnetic element according to claim 1, wherein each of the insulating layers has a thickness in the range of 0.5 nm to 20 nm.

5. A spin-valve thin-film magnetic element according to claim 1, wherein each of the overlay sections has a thickness in the range of 0.1 μm to 0.3 μm in the track width direction.

6. A spin-valve thin-film magnetic element according to claim 1, wherein the laminate comprises the free magnetic layer, a nonmagnetic conductive layer, and an antiferromagnetic layer, for pinning the magnetic moment of the pinned magnetic layer by an exchange coupling magnetic field, which are deposited in that order.

7. A spin-valve thin-film magnetic element according to claim 1, wherein the laminate comprises a nonmagnetic conductive layer, the pinned magnetic layer, and an antiferromagnetic layer, for pinning the magnetic moment of the pinned magnetic layer by an exchange coupling magnetic field, which are deposited, in that order, on each of the two sides of the free magnetic layer in the thickness

direction.

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8. A thin-film magnetic head comprising a spin-valve thin-film magnetic element according to claim 1, the spin-valve thin-film magnetic element functioning as a read element for magnetically recorded information.

9. A thin-film magnetic head according to claim 8, wherein the width of the edge of each of the overlay sections in the track width direction is in the range of 0.01 μm to 0.05 μm.

10. A thin-film magnetic head according to claim 8, wherein the insulating layers comprise at least one oxide selected from the group consisting of aluminum oxide, silicon oxide, tantalum oxide, titanium oxide, zirconium oxide, hafnium oxide, chromium oxide, vanadium oxide, and niobium oxide.

11. A thin-film magnetic head according to claim 8, wherein each of the insulating layers has a thickness in the range of 0.5 nm to 20 nm.

12. A thin-film magnetic head according to claim 8, wherein each of the overlay sections has a thickness in the range of 0.1 μm to 0.3 μm in the track width direction.

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13. A thin-film magnetic head according to claim 8, wherein the laminate comprises the free magnetic layer, a nonmagnetic conductive layer, and an antiferromagnetic layer for pinning the magnetic moment of the pinned magnetic layer by an exchange coupling magnetic field which are deposited in that order.

14. A thin-film magnetic head according to claim 8, wherein the laminate comprises a nonmagnetic conductive layer, the pinned magnetic layer, and an antiferromagnetic layer for pinning the magnetic moment of the pinned magnetic layer by an exchange coupling magnetic field are deposited, in that order, on each of the two sides of the free magnetic layer in the thickness direction.

15. A floating magnetic head comprising a slider and a thin-film magnetic head according to claim 8.

16. A floating magnetic head according to claim 15, wherein the width of the edge of each of the overlay sections in the track width direction is in the range of 0.01 μm to 0.05 μm.

17. A floating magnetic head according to claim 15, wherein the insulating layers comprise at least one oxide selected from the group consisting of aluminum oxide, silicon oxide, tantalum oxide, titanium oxide, zirconium

oxide, hafnium oxide, chromium oxide, vanadium oxide, and niobium oxide.

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18. A floating magnetic head according to claim 15, wherein each of the insulating layers has a thickness in the range of 0.5 nm to 20 nm.

19. A floating magnetic head according to claim 15, wherein each of the overlay sections has a thickness in the range of 0.1 μm to 0.3 μm in the track width direction.

20. A floating magnetic head according to claim 15, wherein the laminate comprises the free magnetic layer, a nonmagnetic conductive layer, and an antiferromagnetic layer for pinning the magnetic moment of the pinned magnetic layer by an exchange coupling magnetic field which are deposited in that order.

21. A floating magnetic head according to claim 15, wherein the laminate comprises a nonmagnetic conductive layer, the pinned magnetic layer, and an antiferromagnetic layer for pinning the magnetic moment of the pinned magnetic layer by an exchange coupling magnetic field are deposited, in that order, on each of the two sides of the free magnetic layer in the thickness direction.

22. A method for making a spin-valve thin-film

magnetic element comprising:

a laminate forming step comprising:

forming a laminate including at least a free magnetic layer and a pinned magnetic layer on a substrate;

forming a first lift-off resist layer on the laminate, the first lift-off resist layer having a pair of side faces and a pair of incisions which are provided on the laminate at both sides in the track width direction such that the pair of incisions lies between the side faces and a contact face which is in contact with the laminate; and

irradiating the laminate with etching particles so as to etch the entirety or a part of the layers constituting the laminate lying at the outer region of each of the side faces of the first lift-off resist layer in the track width direction, the laminate thereby substantially having a trapezoidal cross-section;

a bias layer forming step for depositing first sputtering particles on the two sides of the laminate at a sputtering angle θ_1 with respect to the substrate to form a pair of hard bias layers up to at least the level of the free magnetic layer;

an insulating layer forming step for depositing second sputtering particles at a sputtering angle θ_2, wherein $\theta_1 > \theta_2$, with respect to the substrate to form a pair of insulating layers which extend over the hard bias layers and the laminate in the incisions;

a second resist layer forming step comprising:

removing the first lift-off resist layer; and

forming a second lift-off resist layer substantially in the center of the upper face of the laminate, the second lift-off resist layer having a contact face which is narrower than that of the first lift-off resist layer, a pair of side faces provided in the track width direction, and a pair of incisions, each incision provided between the corresponding side face and the contact face; and

a lead layer forming step for depositing third sputtering particles to form a pair of lead layers which extends over the insulating layers and the laminate in the incisions of the second lift-off resist layer.

23. A method according to claim 22, wherein, after the second lift-off resist layer is removed, the laminate in the incisions is partly etched by being irradiated with second etching particles.

24. A method according to claim 22, wherein the sputtering angle θ_1 is in the range of 60° to 90° and the sputtering angle θ_2 is in the range of 40° to 80°.

25. A method for making a spin-valve thin-film magnetic element comprising:

a laminate forming step comprising:

forming a laminate including at least a free

magnetic layer and a pinned magnetic layer on a substrate;

forming a first lift-off resist layer on the laminate, the first lift-off resist layer having a pair of side faces and a pair of incisions which are provided on the laminate at both sides in the track width direction such that the pair of incisions lie between the side faces and a contact face which is in contact with the laminate; and

irradiating the laminate with etching particles so as to etch the entirety or a part of the layers constituting the laminate lying at the outer region of each of the side faces of the first lift-off resist layer in the track width direction, the laminate thereby substantially having a trapezoidal cross-section;

a bias layer forming step for depositing first sputtering particles on the two sides of the laminate to form a pair of hard bias layers up to at least the level of the free magnetic layer;

a second resist layer forming step comprising:

removing the first lift-off resist layer; and

forming a second lift-off resist layer substantially in the center of the upper face of the laminate, the second lift-off resist layer having a contact face which is narrower than that of the first lift-off resist layer, a pair of side faces provided in the track width direction, and a pair of incisions, each incision provided between the corresponding side face and the contact face;

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an insulating layer forming step for depositing second sputtering particles at a sputtering angle θ_3 with respect to the substrate to form a pair of insulating layers which extend over the hard bias layers and the laminate lying at the outer regions of the side faces of the second lift-off resist layer in the track width direction; and

a lead layer forming step for depositing third sputtering particles at a sputtering angle θ_4, wherein $\theta_3 > \theta_4$, with respect to the substrate to form a pair of lead layers which extends over the insulating layers and the laminate in the incisions of the second lift-off resist layer.

26. A method according to claim 25, wherein, after the insulating layers are formed, the laminate in the incisions of the second lift-off resist layer is partly etched by being irradiated with other etching particles.

27. A method according to claim 25, wherein the sputtering angle θ_3 is in the range of 60° to 90° and the sputtering angle θ_4 is in the range of 40° to 80°.

28. A spin-valve thin-film magnetic element comprising:

a substrate;

a laminate on the substrate, the laminate comprising at least a free magnetic layer and a pinned magnetic layer and

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exhibiting a magnetoresistive effect;

a pair of hard bias layers lying at least on both sides of the free magnetic layer in the track width direction and orienting the magnetic moment of the free magnetic layer in one direction;

a pair of lead layers lying at least on the hard bias layers; and

a pair of insulating layers, each lying at least between one side face of the laminate in the track width direction and each hard bias layer,

wherein the pair of lead layers have overlay sections which extend on parts of the laminate, the edges of the overlay sections being in contact with the laminate.

29. A thin-film magnetic head according to claim 28, wherein each of the insulating layers has a thickness in the range of 0.5 nm to 5 nm at the side faces of the laminate.

30. A thin-film magnetic head according to claim 28, wherein the insulating layers comprise at least one oxide selected from the group consisting of aluminum oxide, silicon oxide, tantalum oxide, titanium oxide, zirconium oxide, hafnium oxide, chromium oxide, vanadium oxide, and niobium oxide.

31. A thin-film magnetic head according to claim 28, wherein the insulating layers further extend between the

hard bias layers and the substrate.

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32. A spin-valve thin-film magnetic element according to claim 31, wherein the hard bias layers and the insulating layers are separated by bias underlayers.

33. A spin-valve thin-film magnetic element according to claim 28, wherein the insulating layers further extend on the top ends of the laminate in the track width direction, and the overlay sections of the leads extend toward the center of the laminate compared with the insulating layers and are in contact with the laminate.

34. A spin-valve thin-film magnetic element according to claim 33, wherein the insulating layers have a thickness in the range of 0.5 nm to 20 nm at top ends of the laminate.

35. A spin-valve thin-film magnetic element according to claim 28, wherein the edges of the overlay sections in the track width direction have a thickness in the range of 0.01 μm to 0.05 μm in the track width direction.

36. A spin-valve thin-film magnetic element according to claim 35, wherein the edges of the overlay sections in the track width direction have a thickness in the range of 0.1 μm to 0.3 μm.

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37. A spin-valve thin-film magnetic element according to claim 28, wherein the laminate comprises the free magnetic layer, a nonmagnetic conductive layer, and an antiferromagnetic layer, for pinning the magnetic moment of the pinned magnetic layer by an exchange coupling magnetic field, which are deposited in that order.

38. A spin-valve thin-film magnetic element according to claim 28, wherein the laminate comprises a nonmagnetic conductive layer, the pinned magnetic layer, and an antiferromagnetic layer, for pinning the magnetic moment of the pinned magnetic layer by an exchange coupling magnetic field, which are deposited, in that order, on each of the two sides of the free magnetic layer in the thickness direction.

39. A spin-valve thin-film magnetic element according to Claim 28, wherein other insulating layers extend between the hard bias layers and the lead layers and to the ends of the laminate in the track width direction.

40. A thin-film magnetic head comprising a spin-valve thin-film magnetic element according to claim 28, the spin-valve thin-film magnetic element functioning as a read element for magnetically recorded information.

41. A thin-film magnetic head according to claim 40,

wherein the insulating layers have a thickness in the range of 0.5 nm to 20 nm at top ends of the laminate.

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42. A thin-film magnetic head according to claim 40, wherein the insulating layers comprise at least one oxide selected from the group consisting of aluminum oxide, silicon oxide, tantalum oxide, titanium oxide, zirconium oxide, hafnium oxide, chromium oxide, vanadium oxide, and niobium oxide.

43. A thin-film magnetic head according to claim 40, the insulating layers further extend between the hard bias layers and the substrate.

44. A thin-film magnetic head according to claim 43, wherein the hard bias layers and the insulating layers are separated by bias underlayers.

45. A thin-film magnetic head according to claim 40, wherein the insulating layers further extend on the top ends of the laminate in the track width direction, and the overlay sections of the leads extend toward the center of the laminate compared with the insulating layers and are in contact with the laminate.

46. A thin-film magnetic head according to claim 45, wherein the insulating layers have a thickness in the range

of 0.5 nm to 20 nm at top ends of the laminate.

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47. A thin-film magnetic head according to claim 40, wherein the edges of the overlay sections in the track width direction have a thickness in the range of 0.01 μm to 0.05 μm in the track width direction.

48. A thin-film magnetic head according to claim 47, wherein the edges of the overlay sections in the track width direction have a thickness in the range of 0.1 μm to 0.3 μm.

49. A thin-film magnetic head according to claim 40, wherein the laminate comprises the free magnetic layer, a nonmagnetic conductive layer, and an antiferromagnetic layer, for pinning the magnetic moment of the pinned magnetic layer by an exchange coupling magnetic field, which are deposited in that order.

50. A thin-film magnetic head according to claim 40, wherein the laminate comprises a nonmagnetic conductive layer, the pinned magnetic layer, and an antiferromagnetic layer, for pinning the magnetic moment of the pinned magnetic layer by an exchange coupling magnetic field, which are deposited, in that order, on each of the two sides of the free magnetic layer in the thickness direction.

51. A thin-film magnetic head according to Claim 40,

wherein other insulating layers extend between the hard bias layers and the lead layers and to the ends of the laminate in the track width direction.

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52. A floating magnetic head comprising a slider and a thin-film magnetic head according to claim 40.

53. A floating magnetic head according to claim 52, wherein each of the insulating layers has a thickness in the range of 0.5 nm to 5 nm at the side faces of the laminate.

54. A floating magnetic head according to claim 52, wherein the insulating layers comprise at least one oxide selected from the group consisting of aluminum oxide, silicon oxide, tantalum oxide, titanium oxide, zirconium oxide, hafnium oxide, chromium oxide, vanadium oxide, and niobium oxide.

55. A floating magnetic head according to claim 52, wherein the insulating layers further extend between the hard bias layers and the substrate.

56. A floating magnetic head according to claim 55, wherein the hard bias layers and the insulating layers are separated by bias underlayers.

57. A spin-valve thin-film magnetic element according

to claim 52, wherein the insulating layers further extend on the top ends of the laminate in the track width direction, and the overlay sections of the leads extend toward the center of the laminate compared with the insulating layers and are in contact with the laminate.

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58. A floating magnetic head according to claim 57, wherein the insulating layers have a thickness in the range of 0.5 nm to 20 nm at top ends of the laminate.

59. A floating magnetic head according to claim 52, wherein the edges of the overlay sections in the track width direction have a thickness in the range of 0.01 μm to 0.05 μm in the track width direction.

60. A floating magnetic head according to claim 52, wherein the edges of the overlay sections in the track width direction have a thickness in the range of 0.1 μm to 0.3 μm.

61. A floating magnetic head according to claim 52, wherein the laminate comprises the free magnetic layer, a nonmagnetic conductive layer, and an antiferromagnetic layer, for pinning the magnetic moment of the pinned magnetic layer by an exchange coupling magnetic field, which are deposited in that order.

62. A floating magnetic head according to claim 52,

wherein the laminate comprises a nonmagnetic conductive layer, the pinned magnetic layer, and an antiferromagnetic layer, for pinning the magnetic moment of the pinned magnetic layer by an exchange coupling magnetic field, which are deposited, in that order, on each of the two sides of the free magnetic layer in the thickness direction.

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63. A floating magnetic head according to Claim 52, wherein other insulating layers extend between the hard bias layers and the lead layers and to the ends of the laminate in the track width direction.

64. A method for making a spin-valve thin-film magnetic element comprising:

a laminate forming step comprising:

forming a laminate including at least a free magnetic layer and a pinned magnetic layer on a substrate;

forming a first lift-off resist layer on the laminate, the first lift-off resist layer having a pair of side faces and a pair of incisions which are provided on the laminate at both sides in the track width direction such that the pair of incisions lies between the side faces and a contact face which is in contact with the laminate; and

irradiating the laminate with first etching particles so as to etch the entirety or a part of the layers constituting the laminate lying at the outer region of each of the side faces of the first lift-off resist layer in the the

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track width direction, the laminate thereby substantially having a trapezoidal cross-section;

a first insulating layer forming step for depositing first sputtering particles at a sputtering angle θ_{d1} with respect to the substrate to form insulating layers which extend over the side faces of the laminate and the top ends of the laminate in the incisions;

a bias layer forming step for depositing second sputtering particles on the two sides of the laminate at a sputtering angle θ_{d2}, wherein $\theta_{d2} > \theta_{d1}$, with respect to the substrate to form a pair of hard bias layers on the insulating layers up to at least the level of the free magnetic layer;

a second resist layer forming step comprising:

removing the first lift-off resist layer; and

forming a second lift-off resist layer substantially in the center of the upper face of the laminate, the second lift-off resist layer having a contact face which is narrower than that of the first lift-off resist layer, a pair of side faces provided in the track width direction, and a pair of incisions, each incision provided between the corresponding side face and the contact face; and

a lead layer forming step for depositing third sputtering particles to form a pair of lead layers which extends over the insulating layers and the laminate in the incisions of the second lift-off resist layer.

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65. A method according to claim 64, wherein, after the second lift-off resist layer is removed, the laminate in the incisions is partly etched by being irradiated with second etching particles.

66. A method according to claim 64, wherein the sputtering angle θ_{d1} is in the range of 40° to 80° and the sputtering angle θ_{d2} is in the range of 60° to 90°.

67. A method for making a spin-valve thin-film magnetic element according to claim 64, wherein, after the hard bias layers are deposited, fourth sputtering particles are deposited to form insulating layers on the hard bias layers.

68. A method for making a spin-valve thin-film magnetic element comprising:

a laminate forming step comprising:

forming a laminate including at least a free magnetic layer and a pinned magnetic layer on a substrate;

forming a first lift-off resist layer on the laminate, the first lift-off resist layer having a pair of side faces and a pair of incisions which are provided on the laminate at both sides in the track width direction such that the pair of incisions lies between the side faces and a contact face which is in contact with the laminate; and

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irradiating the laminate with etching particles so as to etch the entirety or a part of the layers constituting the laminate lying at the outer region of each of the side faces of the first lift-off resist layer in the track width direction, the laminate thereby substantially having a trapezoidal cross-section;

a first insulating layer forming step for depositing first sputtering particles to form insulating layers which extend over the side faces of the laminate;

a bias layer forming step for depositing second sputtering particles on the two side faces of the laminate to form a pair of hard bias layers up to at least the level of the free magnetic layer;

a second resist layer forming step comprising:

removing the first lift-off resist layer; and

forming a second lift-off resist layer substantially in the center of the upper face of the laminate, the second lift-off resist layer having a contact face which is narrower than that of the first lift-off resist layer, a pair of side faces provided in the track width direction, and a pair of incisions, each incision provided between the corresponding side face and the contact face; and

a second insulating layer forming step for depositing third sputtering particles at a sputtering angle θ_{d3} with respect to the substrate to form a pair of insulating layers which extend over the hard bias layers and the laminate

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lying in the incisions of the second lift-off resist layer; and

a lead layer forming step for depositing fourth sputtering particles at a sputtering angle θ_{d4}, wherein $\theta_{d3} > \theta_{d4}$, with respect to the substrate to form a pair of lead layers which extends over the insulating layers and the laminate in the incisions of the second lift-off resist layer.

69. A method according to claim 68, wherein, after the insulating layers are formed, the laminate in the incisions of the second lift-off resist layer is partly etched by being irradiated with other etching particles.

70. A method according to claim 68, wherein the sputtering angle θ_{d3} is in the range of 60° to 90° and the sputtering angle θ_{d4} is in the range of 40° to 80°.

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